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HUGH M. SMITH, Commissioner

IDENTIFICATION OF THE GLOCHIDIA OF
FRESH-WATER MUSSELS

By THADDEUS SURBER

*Assistant, United States Biological Laboratory
Fairport, Iowa*

APPENDIX V TO THE REPORT OF THE U. S. COMMISSIONER
OF FISHERIES FOR 1914



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By THADDEUS SURBER,

Assistant, United States Biological Laboratory, Fairport, Iowa.

In investigations with reference to the natural hosts of our fresh-water mussels, the identification of certain larval forms at times becomes one of extreme difficulty, owing to the close resemblance of certain species one to another. Fortunately, so far as known, the glochidial shell is retained intact, even after metamorphosis in many instances, so that if the observer knows the glochidium, its form, size, and peculiarities, the identification is somewhat simplified, even though the marginal growth of the infant mussel shell is greatly increased in size and the shape modified. Believing that much useless experimentation could be avoided by the discovery of the natural hosts of the various species, much time has been devoted to this end, but at the same time it has not been forgotten that the first requisite is a collection of the glochidia of the various species found in the region worked over. The accumulation of such a collection presents difficulties, as the breeding seasons of certain forms have long been unknown, particularly of the rarer forms. The staff of the Fairport Biological Laboratory have kept this important object in mind, and, while conducting field work in various parts of the Mississippi Valley, have from time to time sent in glochidia of those species found in the vicinity of Fairport so rarely as to elude us at the proper season, and in addition an occasional species not native to our local waters. It has therefore been possible, since the publication of my former paper on the glochidia,^a practically to complete the collection of local forms, the only desiderata now being *Lampsilis leptodon* and *Truncilla triquetra*, both of which are extremely rare in the Mississippi in this vicinity. The former, in fact, is a rather rare shell wherever found.

In the paper before referred to I gave an analytical key for identification of the glochidia figured. This is not attempted in the present instance, as the species are so few it is thought that descriptions and figures will suffice. These descriptions show, by comparison, the relationship with other forms so far as size and general characters are concerned. If the reader so desires, however, the position of the forms here described can easily be determined and placed in proper

^a Surber, Thaddeus: Identification of the glochidia of fresh-water mussels. Bureau of Fisheries Document no. 771, 10 p., 3 pl. (47 fig.), 1912.

sequence in the key. The present method of describing conforms to that used previously, this paper being intended, in fact, to supplement the former one.^a Any information to be of practical use must be available to all investigators, and in the present state of our knowledge of mussel culture the sooner it is made accessible the better; hence the appearance of these papers from time to time.

In the preparation of material no changes have been made in the technique, except that it has been found advisable to stain exclusively with alcoholic cochineal (Mayer's old formula).^b Light, it has been found, plays an important part in the subsequent value of the material—strong light, particularly sunlight, bleaching out the glochidium till its transparency becomes such as to render it worthless. For this reason all material, both glochidia and natural infections of same, as soon as killed should be stored in a light-tight receptacle of some kind and there retained till stained and mounted.

In the descriptions to follow no attempt has been made to arrange the species systematically, an alphabetical arrangement being considered preferable.

Anodonta suborbiculata Say. [Fig. 1.]

Lake Contrary, St. Joseph, Mo., February 20, 1913. Collected by W. I. Utterback; collection of United States Biological Laboratory, no. G-72.

Glochidium of *Anodonta* type, large, subtriangular in shape, with spine at tip of each valve; hinge line straight, long; length slightly greater than depth, 0.325 by 0.320 mm. In general outline *suborbiculata* closely resembles *Anodonta grandis* but may be distinguished by its smaller size.

Thanks are due Prof. Utterback for his kindness in forwarding these glochidia for the station collection. In the vicinity of Fairport this species has apparently become extinct in its usual haunts, because of the unusually dry summer of 1911. During that season all the ponds dried up and many dead shells of this species were taken from the dry pond bottoms by Mr. H. Walton Clark and the writer. Host unknown.

Lampsilis breviculus brittsi Simpson. [Fig. 14.]

Niangua River, Hahatonka, Mo., August 7, 1913. Collected by W. I. Utterback; collection of United States Biological Laboratory, no. G-74.

Lampsilis type; semielliptical; ventral margin rounded; hinge line rather short, nearly straight; general outline of shell constricted at either end below hinge line; size large, 0.230 by 0.290 mm.

^a Surber, op. cit.

^b Lee, Arthur Bolles: The microtometist's vade-mecum. Sixth edition, p. 175. London, 1905.

This glochidium is identical in size with *multiradiata*, but the hinge line is straighter, and the constriction of the outline below hinge, at either side, is characteristic. Compared with *Q. pustulosa*, with which it agrees in size, the hinge line is much longer than in that species while the outline in *pustulosa* below the hinge line is straight. Host unknown.

Lampsilis lienosa unicastata B. H. Wright. [Fig. 15.]

White River, Clarendon, Ark., October 20, 1913. Collected by W. B. Gorham; collection of United States Biological Laboratory, no. G-75.

Semielliptical in shape; short in proportion to depth; ventral margin rounded; hinge line long and but slightly curved; size medium, 0.185 by 0.240 mm.

In general outline this glochidium is of the type represented by *Lampsilis trabalis* and *Obovaria circulus*, being intermediate in size between these two species, but probably nearer *trabalis* in form, particularly in the rather obliquely rounded posterior margin. Host unknown.

Lampsilis multiradiata Lea. [Fig. 2.]

Auglaize River, Defiance, Ohio, July 22, 1913. Collected by H. Walton Clark; collection of United States Biological Laboratory, no. G-70.

Lampsilis type; semielliptical; ventral margin rounded; hinge line short and evenly curved; size large, 0.230 by 0.290 mm.

But for the much longer hinge line and larger adductor this could hardly be distinguished from average examples of *Quadrula pustulosa*, as it agrees in size with that form. Host unknown.

Lampsilis parva Barnes. [Fig. 3.]

Pond near Tulsa, Okla., July 20, 1911. Collected by F. B. Isely; collection of United States Biological Laboratory, no. G-67.

Glochidium semielliptical; ventral margin rounded; hinge line moderately short and evenly curved; size medium, 0.170 by 0.200 mm.

In general outline this glochidium strongly suggests that of *L. ligamentina*, from which it differs in being much smaller and in having a differently shaped adductor; in size it approaches nearest *Q. metanevra*, which has a short hinge line, and *L. anodontooides*, in which the hinge line is slightly depressed. Host unknown.

Lampsilis picta Lea. [Fig. 4.]

Cumberland River, Burnside, Ky., July 14, 1911. Collected by H. Walton Clark; collection of United States Biological Laboratory, no. G-64.

Glochidium semielliptical; ventral margin rounded; hinge line short, slightly curved, and faintly undulate; size large, 0.240 by 0.300 mm.

If we except the shape and size of the adductor this glochidium is almost identical with that of *L. iris*, both in outline and size. The specimen of *iris* used for comparison with this, and from which my figure of that species was drawn,^a came from the Yellow River, Ind. If the character of the glochidium is a factor in the classification of the Unionidæ, and I believe it is, then the separation of *picta* and *iris*, even subspecifically, is difficult. Adult shells of *picta* from the Cumberland River and *iris* from Yellow River seem to differ, but it might be interesting to compare them with a series from an intermediate locality, like the Ohio River, for instance. Host unknown.

Lampsilis purpurata Lamarck. [Fig. 5, 5a.]

Cache River, near Clarendon, Ark., January 15, 1913. Collected by Thaddeus Surber; collection of United States Biological Laboratory, no. G-60.

Proptera type; axe-head shape; with two spines, one at each of the ventral corners of the shell; size large, 0.200 by 0.360 mm.

Though slightly smaller than *alata*, this species is almost identical in shape, except that it has a decidedly more curved ventral margin and better developed hooks. All the members of the axe-head group, so far as known, undergo wonderful changes while passing through their metamorphosis and this species is no exception, the growth of the infant mussel, while parasitic, being as great as *lævissima*.

Host: The specific host of this mussel is apparently the sheepshead (*Aplodinotus grunniens*), on which it occurs as a gill parasite. During January (12th to 16th), 1913, the writer secured five infected fish in the Cache River, Ark., the number borne by each fish being, approximately, as follows: 512, 172, 68, 192, and 500, in various stages of development. One fish bore a single glochidium on the ventral fin, probably more or less accidental.

Lampsilis ventricosa satura Lea. [Fig. 6.]

White River, Newport, Ark., November 16, 1912. Collected by W. H. Thomas; collection of United States Biological Laboratory, no. G-55.

Glochidium semielliptical in shape; ventral margin rounded; hinge line rather oblique; size medium, 0.205 by 0.245 mm.

Closely resembles *ventricosa typicus*, from which it differs only in the oblique hinge line and in having proportionately less depth, the depth of shell being about one one-hundredth of a millimeter less than in *ventricosa*. Host unknown.

Margaritana monodonta Say. [Fig. 7.]

Mississippi River, near Moline, Ill., May 2, 1913. Collected by Arthur D. Howard; collection of United States Biological Laboratory, no. G-68.

^a Surber, op. cit., fig. 46, pl. III.

Semielliptical in shape; ventral margin somewhat acutely rounded; hinge line long, straight; size extremely small, 0.050 by 0.052 mm.

This minute glochidium suggests *Tritogonia tuberculata* in general shape but has less proportionate depth, with longer hinge line. Host unknown.

Obovaria circulus Lea. [Fig. 8.]

Wabash River, Vincennes, Ind., June 9, 1913. Collected by Ernest Danglade; collection of United States Biological Laboratory, no. G-69.

Semielliptical in shape; ventral margin rounded; hinge line long and slightly depressed near center; size medium, 0.170 by 0.215 mm.

This glochidium is apparently intermediate in form between *retusa* and *ellipsis*, but rather nearer the latter, yet it differs from both in being of smaller size. In *ellipsis* the hinge line is straight, while in *retusa* the same line is undulated. Host unknown.

Quadrula coccinea Conrad. [Fig. 9.]

St. Joe River, Fort Wayne, Ind., June, 1913. Collected by H. Walton Clark; collection of United States Biological Laboratory, no. G-71.

Semicircular in shape; ventral margin rounded, somewhat oblique; hinge line long and straight; size medium, 0.160 by 0.160 mm.

This glochidium is of the type represented by *ebena*, *plicata*, etc., and very closely resembles *solida*, with which it agrees in size but differs in the obliquely rounded ventral margin. As a parasite it would be difficult to distinguish from *solida*. Host unknown.

Quadrula heros Say. [Fig. 10.]

Mississippi River, Moline, Ill., September 24, 1912. Collected by Arthur D. Howard; collection of United States Biological Laboratory, no. G-51.

Semielliptical in shape; ventral margin obliquely rounded; hinge line long, undulated, oblique; size large, 0.260 by 0.340 mm.

This glochidium is subject to more variation than any other with which I am familiar. For instance, some specimens from Caddo Lake, Tex., collected by Mr. Austin F. Shira, who has kindly allowed me to study his material, are uniformly shorter and more oval in outline, with hinge line less oblique, than specimens from the Ohio and Mississippi Rivers, and the variation in size is remarkable, the extremes being 0.300 by 0.340 and 0.250 by 0.262 mm. Another example, from White River, Ark., measures 0.280 by 0.380 mm. Notwithstanding its great variation in size, and even outline, this species can not readily be confused with any other, even though the larval gland may have been absorbed, which occurs during metamorphosis. This coiled gland is a prominent feature in the mature

glochidium, as will be noted by reference to the figure (fig. 10), where it is shown without undue amplification.

Host: In Arkansas, last January (1913), I found this species parasitic in considerable numbers on the fins of the sheepshead (*Aplodinotus grunniens*) but none were present on the gills of the same fish. Thus we are forced to conclude it is a fin parasite, notwithstanding the fact that a specimen of eel (*A. chrysipa*) taken at the same place—Cache River, near Clarendon, Ark.—held a single glochidium on its gills, and a “water dog” (*Necturus maculosus*) also held one on the gills. The structure of the gills of the *Necturus maculosus* resembles the fin structure of fishes and may function the same, so it may not be at all remarkable to find mussel larvæ infecting them, at least of those species which take externally on fishes.

Quadrula lachrymosa Lea. [Fig. 11.]

Tributary of Fall River, Greenwood County, Kans., August, 1912. Collected by Kansas Biological Survey; collection of United States Biological Laboratory, no. G-63.

Glochidium (not fully matured) semielliptical in shape; ventral margin rounded; hinge line rather short, usually depressed, but sometimes straight; size small, 0.085 by 0.090 mm.

The shape of this glochidium is suggestive of *Tritogonia tuberculata*, but has a shorter hinge line and less depth; the size is practically the same, and with our present knowledge it might be possible to confuse the two species, especially when examined as parasites. Host unknown.

Quadrula obliqua Lamarck. [Fig. 12.]

Cumberland River, Burnside, Ky., July 14, 1911. Collected by H. Walton Clark; collection of United States Biological Laboratory, no. G-66.

Glochidium of the *trigona* type; semicircular; hinge line long and straight; depth greater than length; size medium, 0.160 by 0.175 mm.

This glochidium seems to be rather intermediate in shape between *Q. trigona* and *Unio gibbosa*, agreeing with the former in length, but with less depth, *trigona* being longer than deep, and *obliqua* deeper than long. While agreeing with *gibbosa* in shape, except somewhat longer hinge line, it is much smaller and is not likely to be confused with it. Host unknown.

Unio crassidens Lamarck. [Fig. 13.]

Cumberland River, Burnside, Ky., July 14, 1911. Collected by H. Walton Clark; collection of United States Biological Laboratory, no. G-65.

Glochidium subtriangular in shape; hinge line long and rather evenly curved; depth greater than length; size medium, 0.150 by 0.160 mm.

In this species the glochidium seems to be intermediate in shape between examples of the *Anodonta* group on the one hand and certain species of the *Lampsilis-Quadrula* group on the other, best represented in the former by *Alasmodonta calceola*, and in the latter by such species as *Quadrula ebena*, etc. Compared with *Unio gibbosa* it is more circular in outline, if we except the pointed ventral margin, and has a shorter, more curved hinge line. It is an aberrant type related to *Margaritana margaritifera*. Host unknown.

EXPLANATION OF FIGURES. (PLATE I.)

- Fig. 1. *Anodonta suborbiculata*.
- Fig. 2. *Lampsilis multiradiata*.
- Fig. 3. *Lampsilis parva*.
- Fig. 4. *Lampsilis picta*.
- Fig. 5, 5a. *Lampsilis purpurata*.
- Fig. 6. *Lampsilis ventricosa satura*.
- Fig. 7. *Margaritana monodonta*.
- Fig. 8. *Obovaria circulus*.
- Fig. 9. *Quadrula coccinea*.
- Fig. 10. *Quadrula heros*.
- Fig. 11. *Quadrula lachrymosa*.
- Fig. 12. *Quadrula obliqua*.
- Fig. 13. *Unio crassidens*.
- Fig. 14. *Lampsilis breviculus brittsi*.
- Fig. 15. *Lampsilis lienosa unicostata*.





